REMARKS

Regarding paragraph 1 of the Examiner's remarks, Applicants thank the Examiner for accepting substitute drawings.

Regarding paragraph 2, in order to promote efficient prosecution of this application, applicants canceled claim 21, the Examiner's rejection under 35 U.S.C. § 112 is moot.

Reading the Examiner's paragraphs 3 and 4, Applicants do not understand. Typically, indicating that arguments with respect to claims 1-35 are now moot, implies the Examiner has withdrawn those rejections; however, in paragraph 4, the Examiner appears to argue because of the Examiner's review of Kahlbaugh et al., the rejections in the 13 November 2002 letter are not withdrawn. Applicants believe that from the contents of this letter, except for the comments of paragraph 4, the rejections have been overcome along with the remaining rejections in the prior letters relate to this recitation from the Kahlbaugh et al. reference.

The remaining issue that appears to be raised by the Examiner, regarding the teachings of the Kahlbaugh et al. reference relates to the filtration performance of the separation media. The Examiner appears to conclude from the reference at Col. 14, line 63 to col. 15, line 6, that the reference teaches a support with substantial filtration properties. Applicants reiterate their position that the Kahlbaugh et al. reference, taken as a whole, suggests that a coarse support layer is used to act as a support for the formation of the fine fiber layers. This coarse support media has little or no filtration properties. Further in the Kahlbaugh context, the coarse media cannot have substantial filtration properties and maintain useful filtration properties in the overall structure. The portion quoted by the Examiner on page 3, last full paragraph, appears somewhat differently in the patent. Applicants believe that the Examiner has inadvertently mischaracterized the recitation. The full quotation is as follows:

> a. It is preferred to select a material which has a very low percentage solidity and a very high permeability, if possible, to enhance the "void space" across which the fine fiber web will extend. A material which has a filtering efficiency of only about 10% or less, typically 5% or less and preferably only 1-4%, for trapping 0.78 micron particles according to the test described herein, sometimes referred to as LEFS efficiency, will be preferred. Preferably it is a material having **a single layer permeability when evaluated by the Frazier Perm Test, of at least 150 meters/min, typically at least about 200-450**

meters/min. (Column 14, line 63 through Column 15, line 6, Bold supplied)

In the preceding paragraph, the recitation establishes an absolute floor on the permeability of this material. This recitation does not teach "substrate layer having a permeability of 150 meters/min..." This recitation clearly indicates that preferably the permeability of the material is **substantially greater than the lower limit recited.** This portion when read with the reference as a whole shows that the coarse separation layer cannot be understood to have any substantial filtration properties. The reference, taken as a whole, teaches the use of a substrate material having a much, much higher permeability and lower efficiency consistent with Applicants' prior arguments.

The following listing is the substance of the disclosure in the Kalbaugh reference regarding the nature of this coarse material from selected portions of Kahlbaugh et al., U.S. Patent No. 5,672,399:

Location	Quotation
Front Page, paragraph [57], under ABSTRACT	A preferred filter media, comprising multiple layers of fine fiber media separated **by coarse fiber support**, is provided.
Column 3, lines 35-37	A preferred filter media construction according to the present invention includes a first layer of **permeable coarse fibrous media having a first surface.**
Column 11, lines 52-58	A general approach for the utilization of fine fibers, i.e. on the order of 8 or 10 microns or less in diameter, preferably 5 microns or less and typically about 0.1 to 3.0 microns in **diameter (average), in filter media has been developed. In general, a very porous, permeable substrate of relatively coarse fibers is used as a support, for the very fine fiber** media.
Column 12, lines 6-9	That is, the media comprises a web of fine fibers on at least one outer surface of **a structure of coarse fibers. The fine fibers in the web of fine fibers, then, are not mixed in or entangled with the coarse fiber support.**
Column 13, lines 47-51	From the above it will be apparent that many typical filter media constructions according to the present invention, when configured for use to filter, will include multiple layers of media, with at least two layers effectively comprising a **coarse framework supporting fine fibers or a fine fiber web.**

Column 14, lines 4-7	Construction 10 includes a layer or region 13 of media comprising a **coarse support 14 having a thin layer** 15 of fine fibers on a surface thereof.
Column 14, lines 21-24	It comprises a stack of layers of fine fibers, each of which is spaced from the next adjacent fine fiber layer **by a coarse separating or support layer**.
Column 14, lines 28-34	Again, there is no requirement that the fine fiber layers be identical to one another, or that the **various coarse support layers be identical to one another. By "discrete"** in this context it is meant that each fine fiber layer is not substantially entangled with the **separating coarse support fibers, but** rather each fine fiber layer generally sits on a surface of a support structure.
Column 14, lines 36-47	**A principal function of the coarse material in filter media layers according to the present invention is to provide for a framework across which the fine fibers are extended. Another principal function of the coarse material is to provide for spacing between the regions or layers of fine fibers, in the stack, so that the separated layers of fine fibers do not collapse into a relatively dense (i.e. low permeability and relatively low loading) construction. The coarse support/spacing structure is not typically provided to serve any substantial filtering function. Indeed, it preferably is a material so open and permeable that it does not serve any substantial filtering function.**

Column 14, lines 63-66	a. It is preferred to select a material which has a very low percentage solidity and a very high permeability, if possible, to enhance the "void space" across which the fine fiber web will extend.
Column 14, line 66 through Column 15, line 3	A material which has a filtering efficiency of only about 10% or less, typically 5% or less and preferably only 1-4%, for trapping 0.78 micron particles according to the test described herein, sometimes referred to as LEFS efficiency, will be preferred.
Column 15, lines 3-6	Preferably it is a material having a single layer permeability when evaluated by the Frazier Perm Test, of at least 150 meters/min, typically at least about 200-450 meters/min.
Column 15, 47-50	In addition, it is an advantage that the coarse support can be provided from readily available fibrous material such as polymeric fibers.
Column 15, lines 50-51	Thus, commercially available materials can be chosen as the coarse support or scrim.
Column 15, lines 52-54	d. The material from which the coarse support is formed should be one to which the fine fibers can be readily and conveniently applied.
Column 16, lines 10-17	In general, it is believed that commercially available fibrous scrims can be used as the coarse support. One such scrim is Reemay 2011, commercially available from Reemay Co. of Old Hickory, Ind. 37138. In general, it comprises 0.7 oz., spunbonded polyester. Alternatively, Veratec grade 9408353, spun bonded polypropylene material, from Veratec, Walpole, Mass. 01081, is usable.
Column 16, lines 25-28	a. It should be a material that can be readily formed into fibers with the relatively small diameter selected, for application to the coarse support, or into a web or network of such fine fibers.
Column 16, lines 32-33	c. It should be a material which can be readily applied to the coarse support.
Column 16, lines 40-45	It is foreseen, however, that similar techniques and webs, applied to coarse support structures as described herein, and used in stacked arrangements as described herein, would comprise appropriate and useable applications of the present invention.
Column 16, lines 65-66	The fine fibers can be secured to the coarse support in a variety of manners.

Column 17, lines 31-35	In general, from the above it will be apparent that a layer of media used in constructions according to the present invention will generally **include a coarse support** having a layer or web of fine fibers secured to at least one surface thereof.
Column 18, lines 24-29	It is foreseen that in typical, preferred constructions having fine fiber diameters of about 0.1 to 5.0 microns, the mass of material from which the fine fibers are formed, **applied per unit surface area of scrim or coarse support, will be within the range of about 0.2 to 25 g/m^2**, regardless of the particular material used.
Column 18, lines 30-35	An alternate method to characterize a typical and preferred media layer in constructions according to the present invention is with respect to the amount of interfiber space open or visible, when looking into **the coarse fiber support** or scrim (from the fine fiber side), that is occupied by or covered the fine fibers or web of fine fibers.
Column 18, lines 41-43	**The coarse support comprises polyester fibers of 25 to 35 microns in diameter. The fine fibers generally comprise glass fibers from about 0.1 to 3 microns in diameter**.
Column 19, lines 3-14	In general, **if a coarse fiber support** structure comprising fibers having an average diameter of at leas 10 microns, and also having an efficiency of 6% or less, for 0.78□ particles when evaluated as described herein, is improved by application of at least one fine fiber layer thereon, wherein the fine fibers have an average fiber diameter of about 5 microns or less, such that the improved material when tested has an efficiency of at least about 8%, and preferably at least 10%, for the 0.78□ particles defined, the construction will be one which has at least some of the desirable properties for use in at least certain preferred arrangements according to the present invention.
Column 27, lines 33-35	**M. Positioning of the Fine Fiber on the Coarse Support; Orientation of the Fine Fiber Layer with Respect to Fluid Flow**
Column 30, lines 30-32	In those instances the media comprised a layer of glass microfibers on a porous **polyester scrim (Reemay 2011).**
Column 30, lines 34-36	The coarse scrim generally comprised the polyester scrim described above, commercially available **under the designation Reemay 2011**.

Column 34, lines 11-15	For instance, if a composite had an LEFS efficiency of 50% and was made of 6 layers, each layer (Reemay 2011 substrate with fine fibers thereon) would have an LEFS efficiency of 10.9%.
Column 39, lines 46-49	**It comprises DCI polymeric fine fiber deposited on Reemay 2011, depicted at 100-fold magnification. The media depicted had a percent efficiency of 12% LEFS.**

The portions shown above disclose a layer between fine fiber that is a course layer for "support/spacing" (Col. 14, lines 36-47) functions not to add filtration properties to the structure. The portion that discusses permeability and efficiency (Col. 14, line 63 to Col. 15 line 6) indicates that the **permeability is to be maximized** while the **efficiency is kept to a minimum.**

Applicants challenge the Examiner's position that the reference teaches that the support has a "permeability of 150 m/min (2.5 m/sec) and an efficiency of 10 percent ..." (page 3, the last paragraph). These parameters are extreme limits of the ranges in the patent. In use, the materials disclosed will not simultaneously possess these extreme layer characteristics. In a real material that is optimized for both high permeability and low efficiency, these extreme limits could not be reached and would not be used by one skilled in the art.

The Reemay 2011 scrim material that is used as a coarse support material in the exemplary section of Kahlbaugh et al. is a material made by spinbonding polyester fiber. The Reemay scrim has a very low efficiency on standard 0.8 micron polystyrene particles typically less than 4% with a high permeability of 1070 ft./min (326 m/min). Attached to this letter is a copy of product specification materials discussing the nature of Reemay 2011 scrim showing that it is deliberately chosen not to have filtration properties, particularly when compared to other non-woven materials made by the same vendor having substantially higher filtration properties. The Reemay scrim is selected for its structural support and separation characteristics not its filtration characteristics.

Further, Applicants submit the enclosed Kahlbaugh declaration demonstrates that Kahlbaugh et al. reference does not teach the invention. Kahlbaugh et al. show a substantially different technology than that claimed. Kahlbaugh et al. discloses a unique filter laminate that is unrelated to the claimed invention. Kahlbaugh et al. discloses a structure designed to operate efficiently with multiple layers of fine fiber separated by course non-filtration support layer having little or no filtration properties. Kahlbaugh Dec. ¶ 4.

The overall filtration efficiency of the materials claimed is substantially degraded if a layer of media with substantial filtration properties is inserted into the Kahlbaugh et al. structure. The claimed invention uses a cooperation between a filter medium layer and two or nor fine fiber layers to obtain filtration properties. Any random substitution of layers in the Kahlbaugh et al. structure would likely not result in a useful filter structure. Kahlbaugh Dec. ¶ 8.

In the instant action, the Examiner has rejected filter article claims 1-10 under 35 U.S.C. § 103(a) over a combination of Kahlbaugh et al., U.S. Patent No. 5,672,399 in view of Teague et al., U.S. Patent No. 5,409,513. The Examiner has also rejected method claims 11 to 24 over the same art using similar arguments. The Examiner has also rejected filter article claims 25 to 35 over the same art using similar arguments. For efficiency purposes, Applicant will respond to these rejections grouped together. Neither Kahlbaugh nor Teague relate in any substantial way to the claimed invention and are not logically combinable. Applicants respectfully traverse.

The Examiner argues that Kahlbaugh et al. disclose certain aspects of a filter structure as described in the previous Action, in the Action at pages 5, 13 and 22, and further argues that:

> Teague et al. discloses a filter media including a layer of **fine fiber** having a pore size of 1 micron in col. 5, lines 27-60.
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the pore size of Teague et al. into the fine filter layer of Kahlbaugh et al. '399 to provide a fine fiber layer having a desired efficiency and permeability.
>
> Furthermore, Kahlbaugh et al. '399 teaches adjusting the average pore size between adjacent fibers in the web to adjust the efficiency of the layer in page 32, lines 9-63.
> (bold supplied)

The Examiner appears to argue at page 5, second full paragraph, that:

> Teague et al. discloses a filter media including a layer of **fine fiber** having a pore size of 1 micron in Column 5, lines 27-60.

Teague teaches, Column 5, lines 28-60, in fact, that:

> ... The filter may have constant pore size or tapered pore size and may be composite structures comprising multiple medium layers and/or multiple support layers. The pore size is in the range of from about 1 to 50 micrometers, preferably from about 4 to 30 micrometers and most preferred from about 5 to 20 micrometers.
>
> Fibrous filter media may be made from organic or inorganic fibers or microfibers. Exemplary organic fibers include those made from polyolefins for example, polyethylene, polypropylene, polymethylpentane, polyisobutylene, and copolymers thereof, for example, ethylenepropylene; polyesters, for example, polybutylene terephthalate and polyethylene terephthalate and polyamides for example, polyhexamethylene adipamide (nylon 6/6), polyhexamethylene sebacamide (nylon 6/10), nylon 11 (prepared from 11-amino-nonanolic acid), and homopolymers of polyepsiloncaprolactam (nylon 6), and mixtures or blends of such polymers. The fibers may be made of other polymers which can be formed into fibers and mixtures of fibers also can be used.
>
> Suitable inorganic fibers include those made from glass, metals or metal compounds like metal titanates, e.g., potassium titanate. Preferred for the present invention is glass.
>
> The filter fibers generally will have diameters of from about 0.1 to about 20 micrometers. The filter fibers may vary in length from relatively short staple-like microfibers of about 12.7 mm or less up to substantially continuous filaments several feet or more in length. Typically, the median length to diameter ratio of the fibers will be in the range of from 500 to 1,000.

This portion does not teach fine fiber or a multilayer structure. Applicants believe the Examiner asserts that Teague et al. discloses a filter comprising fine fiber and media and is arguing that Kahlbaugh et al. and Teague et al. taken together show the claimed structure having fine fiber parameters.

Overall the Examiner is focused on the minutia of the pore size of the claims and not the invention as a whole.

First, there is insufficient commonality between Kahlbaugh et al. and Teague et al. to combine the references. Kahlbaugh et al. disclose a replaceable cartridge, while Teague et al. disclose a candle filter (a metal structure) having a single layer replaceable media. Kahlbaugh Dec. ¶ 3. These structures are different aspects of filtration technology and are not directly comparable. Kahlbaugh Dec. ¶ 4.

There is no mention in Teague et al. of the use of a fine fiber layer with a media layer. The portion cited by the Examiner has no mention of fine fiber. The portion cited by the Examiner appears to teach a single layer of a conventional disposable media material that can be replaced when necessary in the candle filter of Teague et al. Teague et al. teach a single conventional filter media layer with no disclosure of a second fine fiber layer. Kahlbaugh Dec. ¶ 6. The portion highlighted by the Examiner relates to a conventional media layer different in all respects to the fine fiber layer shown in Kahlbaugh et al. While some trivial overlap, of the (e.g.) fiber diameter or pore size range with the media fiber diameter or pore size range, may be shown in Teague, one of ordinary skill would read conventional fiber parameters in Teague not fine fiber or nanofiber parameters.

The Kahlbaugh et al. reference, taken as a whole, uses a spacer material that is not considered to be a filtration medium or substrate. Kahlbaugh Dec. ¶ 4. The material in Teague et al. is a single layer filtration material with no fine fiber either in the layer or as a separate layer. The general reference to fiber size of the fibers in the media layer cannot be taken to indicate the use of fine fiber without a more explicit disclosure. Accordingly, since Teague et al. do not use a layer of fine fiber and Kahlbaugh et al. do not use a layer of conventional filtration media, the combination must fail. Kahlbaugh Dec. ¶ 8.

One of ordinary skill in the art would not use the filtration media of Teague et al. in the structure of Kahlbaugh et al., since Kahlbaugh et al. clearly suggest that the material placed between the fine fiber layers is a separation layer, not a filtration media material. The single layer Teague et al. material would be harmful to the filtration properties in the Kahlbaugh et al. structure. Adding substantial filtration media to the Kahlbaugh structure could substantially reduce utility.

The Examiner has further rejected method claims 11-24 and 25-35 under 35 U.S.C. § 103(a) with substantially the same arguments in the combination of Kahlbaugh et al. with

Teague et al. Applicants restate their arguments regarding this combination obviousness rejection.

In paragraph 9 of the Action, the Examiner has rejected claims 4, 14 and 28 under 35 U.S.C. § 103 over the combination of Kahlbaugh et al. and Teague et al., further in view of an alleged public use or sale of the invention. Applicants respectfully traverse, and do not acquiesce in the Examiner's statement of the alleged public use or sale, nor do the Applicants agree with the Examiner's position on any rejection under 35 U.S.C. § 103 based on Kahlbaugh et al. and/or Teague et al.

In order to advance the prosecution of this specific application, Applicants have elected to cancel claims 4, 14, and 28. The alleged public use and sale will be dealt with in other copending applications. Applicant has filed a complete response to the "use" rejection in the related case, U. S. Serial Number 09/871,583.

Briefly, Applicants disagree with the Examiner's position that there is no evidence to support the Experimental use. Applicants assert that, taken as a whole, the "use" was experimental and the invention was not complete until a demonstration of utility for its intended purpose in its intended environment was made. The facts surrounding the trial constitute evidence of an experimental use of the filters using fine fiber. The inventors needed to ensure that the fine fiber could be spun onto substrate, the substrate and fine fiber could be manufactured into a filter and that filter could survive installed use under varying conditions of temperature and humidity.

With respect to Applicants' control of the filter units, Applicants were intimately acquainted with the operations conducted at the test sites, knew that the fibers would be monitored on a minute-by-minute basis and knew that any failure would be immediately be reported. Applicants recorded a unique numbering system to keep control of the invention should any units be returned. Lastly, the locations selected by Applicants were those most suitable for the trial. Until Applicants could be confident that the fibers could be manufactured and used successfully, the invention was not "completed" until the end of the use experimental

trial.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Respectfully submitted,

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17 June '03
Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please cancel claims 4, 14, 21 and 28.

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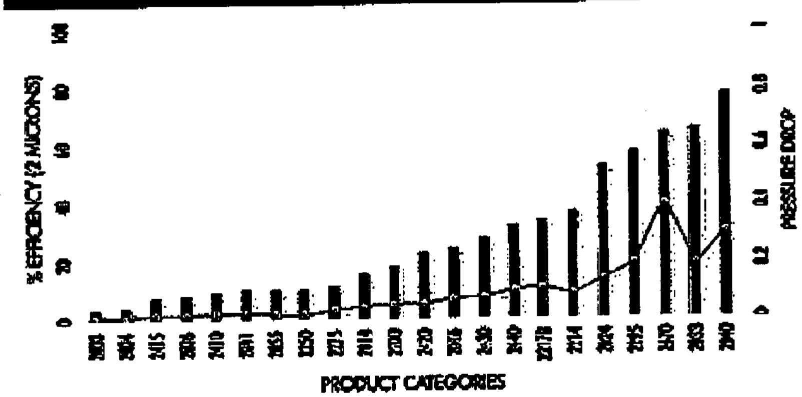

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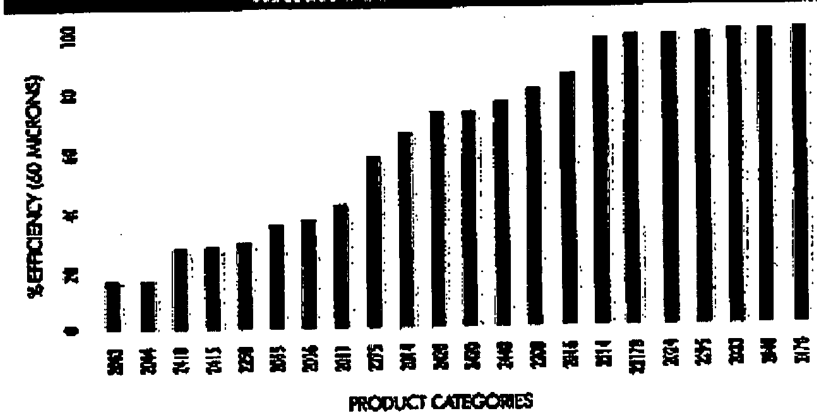

REEMAY® FILTRATION GRADE SPUNBONDED POLYESTER

Typical Properties*

Style No.	Denier Per Filament	Filament Cross Section	Basis Weight oz/yd²	Basis Weight g/m²	Thickness mils	Grab Tensile lbs. MD x XD	Trap Tear lbs MD x XD	Mullen Burst psi	Frazier Air Perm cfm/ft²@ 0.5" H₂O	Textest Air Perm cfm/ft²
Straight Fibers										
2003	4	T	0.35	12	4	8 x 5	2 x 2	8	1600	—
2004	4	T	0.40	14	5	16 x 9	3 x 3	9	1400	1516
2055	4	T	0.55	19	7	11 x 9	3 x 4	N/A	1200	1418
2006	4	T	0.60	20	7	10 x 8	4 x 5	13	1180	—
2011	4	T	0.75	25	9	16 x 14	6 x 6	16	1070	—
2014	4	T	1.00	34	10	21 x 17	6 x 7	22	880	863
2016	4	T	1.35	46	10	36 x 27	9 x 11	32	540	—
2024	4	T	2.10	71	12	62 x 52	9 x 11	52	310	339
2033	4	T	2.95	100	17	102 x 78	15 x 17	N/A	258	256
2040	4	T	4.00	136	20	125 x 100	14 x 19	99	198	174
2250	2.2	R	0.50	17	5	11 x 7	4 x 5	11	1080	1307
2275	2.2	R	0.75	25	6	15 x 14	6 x 7	17	860	—
2200	2.2	R	1.05	36	8	21 x 20	7 x 7	23	663	—
2214	2.2	R	1.35	46	9	32 x 30	9 x 10	28	521	—
2217B	2.2	R	1.70	58	11	38 x 36	12 x 12	N/A	456	—
2295	2.2	R	2.95	100	18	75 x 71	23 x 24	74	250	—
Crimped Fibers										
2410	4	T	1.15	39	14	15 x 11	7 x 8	N/A	N/A	—
2415	4	T	1.55	53	16	24 x 18	9 x 11	N/A	N/A	—
2420	4	T	1.85	63	17	30 x 22	11 x 13	N/A	N/A	—
2430	4	T	2.40	82	19	44 x 34	15 x 18	N/A	N/A	—
2440	4	T	2.90	98	21	56 x 42	18 x 23	N/A	N/A	—
2470	4	T	6.00	203	32	136 x 100	37 x 47	82	166	—

Note: 2000 Series Trilobal Fiber Diameter = 20 µ; T = Trilobal Cross Section. 2200 Series Round Fiber Diameter = 15 µ; R = Round Cross Section. 2400 Series Trilobal Fiber Diameter = 20 µ. 2800 Series Trilobal Fiber Diameter = 20 µ.

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Reemay, Synergex, Typar Filtration Media Typical Properties Sheet
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